

AMATEUR RADIO

JUNE
1946

JOURNAL OF THE WIRELESS INSTITUTE OF AUSTRALIA

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Heater current	0.3 amps.
Plate	250 volts
Plate current	3.0mA.
Neg. grid bias	—2 to —23 volts
Grids 2 — 4 (screen)	100 volts
Screen current	3.0mA.
Conversion Slope	650 μ A/V.
Plate resistance	1.3 meg.
Osc. anode 100V.	3.3 mA.
Osc. grid current	0.2mA.
Osc. grid resistor	50,000 ohms
Osc. slope	2.8 mA/V.

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Editorial

One cannot but be impressed by the wide field of Amateur activities covered by the directions, which the Federal Council at the recent Federal Convention has given to the incoming Federal Executive. The decision reached, not only give your Executive clear cut policy directions, but have set the stage for action on all aspects affecting the welfare of the Australian Amateur in the post-war period. This 1946 Convention unquestionably set a new high, not only in inter-Divisional Co-operation, but also in Federal consciousness, the latter being exemplified in person by the Delegates themselves but equally by the Divisional Councils who instructed them.

The W.I.A. has a very full year ahead. Initially the Divisions will be carrying on the overhaul of their domestic machinery, for a thorough "house cleaning" is essential if we are going to cope effectively with the changed circumstances and conditions to-day. Amateur Radio has wider horizons and a new status to-day, both very different from pre-war days. Then we used to talk of the Ham as "a potential National Asset," to-day, he is a PROVEN National Asset tested in six and a half years of war. Then we used to speak of "2½ mx" as "the ultra highs," but to-day thereabouts is merely the very high frequency portion of the spectrum, for beyond stretches limitless new fields in the Super High frequencies. To-day we stand on the threshold of new achievement as assuredly as the old timers did when they were given "200 mx and below."

Our membership is the largest in the history of the W.I.A., but of comparable importance is the fact that the average technical standard of members is at a considerably higher level than ever before, owing to the intensive war time training and experiences of Hams who were in the Services or the Radio Industry. This, however, has brought a complementary problem in its train, as those Hams who served during the war on the Home front, outside Radio, find themselves with a tremendous amount of leeway to make up. They find themselves confronted with a bewildering array of new techniques and devices and a whole new vocabulary embracing wave guides and magnetron, P.E.'s and P.R.F. and so on. Bridging the gap between the war trained Ham and the Amateur out of touch with war time technical developments, is an important and urgent task which the W.I.A. has been tackling seriously.

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FREQUENCY MODULATION EQUIPMENT

* By J. Brown, VK7BJ

\$ PART II

Before dealing with the equipment needed for transmission and reception of Frequency modulated signals, the matter of phase shift must be mentioned, as it is continually occurring. Two waves of the same frequency need not be at the same portion of their cycle at the same time, in Fig. 1a, wave B is zero and going positive 90 degrees after wave A and is said to have a phase difference of 90 degrees lagging on A. This phase difference can have any value between 0 and 360 degrees, lagging or leading. In A.M. transmission we are not much concerned with deliberate phase changing except in the case of a push-pull amplifier, where two voltages 180 degrees out of phase are needed. Whilst this is fairly easily accomplished, in F.M. we generally have to provide for phase changes of 90 degrees, and this is not so simple.

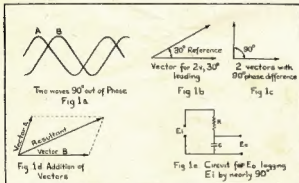


Fig. 1.

Before describing some common methods, it will be best to introduce a simple way of picturing waves. Instead of actually drawing the waves, use is made of vectors, which take into account both phase and amplitude. A vector is a straight line used to depict a wave, its length representing the amplitude of the wave and its direction or angle, the phase. See Fig. 1b (angles of lag are measured clockwise). When two or more waves are combined, if they are of the same frequency, they form a new wave with the same frequency but a different phase angle and amplitude. The new wave can be obtained from the vector diagram by adding the vectors, this being done by completing the parallelogram for two of them at a time and drawing the diagonal. The diagonal gives the phase angle and amplitude of the new wave (Fig. 1d).

Fortunately, the phase change most often required in F.M. is 90 degrees and this is fairly easily obtained if the action of resistance, inductance, and capacity on an A.C. current is considered. When an A.C. voltage is applied to a resistance a current flows, this current being in phase with the voltage and its magnitude depending on the resistance. In the case of an inductance the current which flows, will be 90 degrees behind the voltage and for a condenser it will lead the voltage by 90 degrees, the magnitude in both cases depending upon the reactance of the component. If the circuit consists of resistance and reactance, the total impedance must be obtained by adding the components vectorially and if one of these is

much larger than the other, the smaller one will have very little effect on the total impedance of the circuit.

A simple arrangement for getting a 90 degrees phase change uses a condenser and resistor in series (Fig. 1e.). If R is much larger than the reactance of C the impedance will be mostly resistive and the current will be nearly in phase with applied voltage E_i . This current, in flowing through the condenser, will cause a voltage drop, which will lag the current by 90 degrees, across it and so the output voltage E_o will lag the applied voltage by 90 degrees. Results can be varied by making the reactance of the condenser larger than the resistance, or by using an inductance in place of the condenser; the output voltage always being taken off the component with the lower impedance.

This simple arrangement is suitable for all frequencies where the resistance/ratio does not approach too close to unity, but it does not give exactly 90 degrees phase change. More complicated arrangements are used in commercial transmitters, the simplest of these being a series tuned circuit. The circuit is tuned to resonate at the operating frequency and behaves as a pure resistance, the applied voltage and the current being in phase. A voltage lagging 90 degrees can be taken from across the condenser or one leading 90 degrees from across the inductance.

We can now deal with the circuits required for F.M. transmission and reception. The signals are in the UHF band and for satisfactory operation of the receiver a large signal is required at the detector circuit, indicating that the superheterodyne is the most suitable type. To enable the large frequency band required to be passed, a high I.F. frequency (in the 5 Mc/s region) is used. This also helps to eliminate image interference. In order to flatten the pass band, resistance loading of the I.F. transformers is sometimes used, and to provide the high gain required special valves of the 6SG7 or 6AC7 type are preferable. So far the receiver is not very much different from the conventional A.M. receiver for these frequencies but, instead of applying the output of the I.F. amplifier to a rectifier, it is passed on to a limiter-discriminator circuit which converts the F.M. signal to an A.F. output voltage.

The limiter serves to remove any noise, etc., which may appear as amplitude modulation of the signal. The signal is fed into the stage at a high level, all the peaks being shaved off, and only a signal of constant amplitude passed on. For this reason the I.F. amplifier must provide a large output in order to secure the full advantage of the noise limiting. There are many types of limiters but most of the simple ones possess disadvantages. One type is the grid-leak limiter, the action being similar to the ordinary grid-leak detector, a high negative voltage will be developed across the grid-leak R . When a noise peak arrives, on the negative peak the grid is driven further negative and the plate current cuts off. However, for impulse noises, the positive peak is not very much affected. A second type depends upon anode saturation. This has a very low value of screen and plate voltage and if the grid is made more positive very little more output current can flow. Thus when a noise peak arrives the positive peak will be suppressed but, however, the negative peak will not be very much affected. A good arrangement is a combination of the two (Fig. 2), the negative peak being suppressed by the grid-leak action and the positive peak by plate saturation. In order to get more effective action two noise limiters in series are sometimes used. AVC is not often used in S.M. receivers, as the largest possible signal is required at the input to the limiter and its output is constant pro-

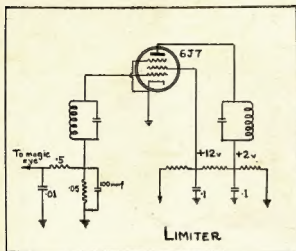


Fig. 2.

vided the signal does not fall below the limiting level. However, an AVC voltage is obtained across the grid-leak of the limiter and may be used to operate a tuning indicator, or is sometimes applied to the R.F. stages (if any).

Conversion of the F.M. carrier into an A.F. signal may be accomplished in several ways. An ordinary A.M. receiver will detect F.M., if the signal is tuned half way down the side of the selectivity curve. Variation of the carrier frequency will then vary the detector output, but the action is not very linear and is inconvenient to tune. Also the noise suppression advantages of F.M. are lost. An F.M. signal may also be detected by means of a super-regenerative receiver but again the advantages of quality and noise suppression are lost. A practical development of the detuned receiver idea is to use two tuned circuits, one tuned above the mean frequency and the other below it, these being fed from a limiter. The two circuits are detuned by an amount greater than the frequency deviation to be received and the carrier is tuned to the centre point. The circuits, together with their associated diodes, may be considered to be in push-pull, thus improving linearity. When the carrier is unmodulated, equal voltages are applied to the diodes and the voltages across the load resistance cancel out. When the frequency is on either side of the mean, one diode will have a higher voltage applied to it than the other and the

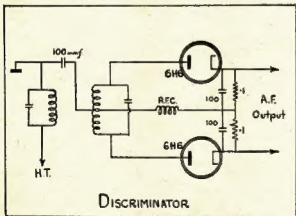


Fig. 3.

cancellation in the load resistance will not be complete, thus an output voltage will be developed. This voltage will be either positive or negative depending upon which diode has the greater voltage applied to it, i.e., depending on which side of the mean frequency the carrier is at that instant. This system is perfectly workable but is hard to line up and so is not often used.

The arrangement usually used is the discriminator shown in Fig. 3. Both circuits are tuned to the mean frequency and the circuit depends for its operation on phase changes in the transformer when the carrier frequency is varied. At resonance the voltage across the secondary is 90 degrees out of phase with the voltage across the primary. The voltage applied to each diode is the vectorial sum of the primary voltage and the half of the secondary voltage across which the diode is connected. As diagram 11 shows, at resonance the total voltage applied to each diode will be equal and no output will be obtained as complete cancellation occurs in the diode load resistances. At frequencies other than resonance the primary and secondary voltages are no longer 90 degrees out of phase and so the vector diagrams will be as shown in Fig. 4, B and C. It will be seen that the voltages applied to the diodes are no longer equal and so a voltage will appear at the output of the diode load, being either positive or negative depending on which diode has the larger input, i.e., on which side of the mean frequency the carrier is at that instant.

The remainder of the receiver consists of the A.F. amplifier which should be designed for high fidelity, power supply, speaker, etc., all of which involve no new principles.

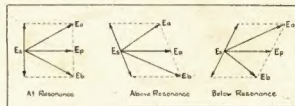


Fig. 4.

Fig. 4. Phase and Voltage Relationship in the Discriminator.

Note:— E_a and E_b represent voltage between plates of diodes and earth in Discriminator circuit of Fig. 3.

At the transmitting end, there are many schemes for producing F.M. but, at the moment, only three seem to offer much promise for the amateur. The first of these is the reactance tube method. A valve is connected as shown in Fig. 5, by means of a phase-splitter a grid voltage 90 degrees out of phase with the plate voltage is obtained and this causes a change of plate current which will also be 90 degrees out of phase with the plate voltage. Thus the plate circuit of the valve is caused to appear as a reactance, either capacitive or inductive, depending on the precise connections of the tube. By varying the gain of the tube the value of the plate reactance will also be varied and, if the plate circuit is connected across the frequency controlling tank of a self excited oscillator, the frequency of the transmitter will be controlled by the grid voltage variation of the reactance tube. The initial frequency deviation obtained is generally not as much as desired, but it can be increased by placing the oscillator on a low frequency and multiplying to get the final frequency, e.g., an oscillator on 3600 Kc/s varying between 3957 and 3603 Kc/s (a deviation of 3 Kc/s), when multiplied by 8 would have a mean frequency of 28,800 Kc/s per second and would vary between 28,776 and 28,824 Kc/s per second (a deviation of 24 Kc/s).

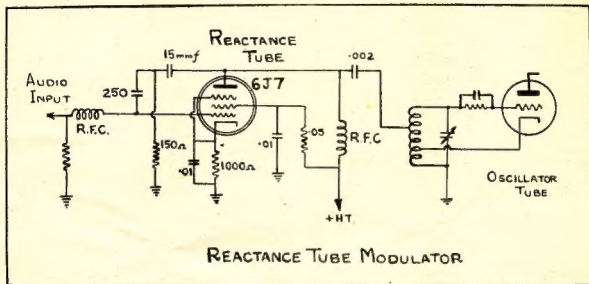


Fig. 5.

As the transmitter must be self excited, its stability is such that it is suitable only for the UHF band. It is possible, however, to improve the stability by referring the mean frequency to a crystal control oscillator. The output of an oscillator is fed to a mixer tube where it is beat against a crystal oscillator and the beat-frequency (465 Kc/s would do) is fed to a discriminator of the type previously described. The discriminator will give no voltage output when the beat is exactly 465 Kc/s, i.e., when the self excited oscillator has its correct frequency, but if it has not, the beat will not be 465 Kc/s and an output voltage will be delivered from the discriminator, the polarity depending on the direction of the frequency departure. The modulation components are filtered off by an R.C. filter and the voltage is then applied as a bias to the grid of the reactance tube, which causes it to alter the oscillator frequency. The circuit is so poled that, if the oscillator mean frequency tends to change, the variation in reactance tube bias will pull it back again. The control is good but not perfect, however, as a frequency change must occur before any control voltage is developed.

The second type of modulator is, I am afraid, much more complicated, but theoretically and practically it is the type originally used by Armstrong and produces phase modulation which is changed to frequency modulation by means of a filter in the audio input circuit. This filter reduces the amplitude of an audio frequency signal in accordance with its frequency, thus converting phase modulation to frequency modulation (see article 1). The circuit uses a crystal control oscillator. The output of the crystal oscillator is split into two halves, one half undergoes a 90 degrees phase shift and the other is passed through a balanced A.M. modulator which eliminates the carrier and produces only side bands. The side bands are then combined with the portion of the carrier which has been shifted 90 degrees, giving rise to phase modulation. The side bands may be represented as a pair of vectors which, as they are of different frequencies to the carrier (one above and one below), are continually changing their phase in relation to it. For 100% A.M. the side bands each have half the carrier am-

plitude and rotate in opposite directions. For A.M. at the point at which the side bands are in phase with each other they are also in phase with the carrier. In the Armstrong system, however, the carrier (or the side bands) shifted 90 degrees and so, when the side bands are in phase with each other, they are 90 degrees out of phase with the carrier.

The maximum phase change that can be obtained gives a deviation ratio of not much more than one, but for linearity it must be restricted to about 5. If we are to transmit a 30 cycles per second audio frequency with a deviation of 75 Kc/s per second we need a final deviation ratio of 2,500 and we would have to multiply our frequency by 5,000 times to get the required deviation, i.e., if the carrier were to be 50 Mc/s the original oscillator would have to be on 10 Kc/s. As this is impracticable, a dodge has to be introduced. Say we start with a frequency of 200 Kc/s and multiply it to 10,000 Kc/s, this also increases the deviation by 50 times. This is then beat against a crystal oscillator and a low frequency beat (say 500 Kc/s) is picked out. This low frequency signal retains the deviation of the 10,000 Kc/s signal and if we now multiply to our final carrier frequency (50 Mc/s), we get a further multiplication of 100 and so our total deviation increases is 50 by 100 equals 5,000 times. The whole arrangement is very complicated and the frequency control is not perfect as, owing to the tremendous frequency multiplication involved, many unwanted deviations are also magnified.

For amateur work smaller deviations are satisfactory as it is not required to transmit such low audio frequencies. Therefore the same degree of multiplication is not required and the apparatus is somewhat simplified. Starting in the 160 metre band and neglecting audio frequencies below 200 cycles a deviation of approximately 3 Kc/s can be obtained in the 6 metre band by straight multiplication. By multiplying to the 20 metre band, beating back to the 160 metre band and then multiplying to the 6 metre band a deviation of approximately 25 Kc/s could be obtained. On the whole, however, the circuit is not very attractive to amateurs.

Continued on Page 27.

CLEARING THE ETHER, SERIES II, Part II

* By G. Glover, VK3AG

ADVICE TO THE NEW AMATEUR.

First of all the writer must congratulate the candidate upon his successful negotiation of the examination and tend to him a hearty welcome to the "Ham Fraternity."

We will presume that he is an honest fellow, and unlike most hams has waited until the day AFTER receiving the Official Station Licence before commencing operations. (How many new hams can truthfully say that?) Well, now his troubles have begun in real earnest. Firstly, he is deluged with advice of all sorts and descriptions, and from every Tom, Dick and Harry. All well meant by well meaning hams anxious to give the newcomer to the game the benefit of their own personal experiences. After listening to all this advice the poor newcomer begins to tremble at the knees at the thought of all the trouble he has let himself in for. What with High C, Hartley, T.P.T.G., Series and Shunt Feed, etc., the poor fellow is an absolute nervous wreck and acquires that look so commonly attributed to Radio fanatics.

The writer's advice to all newcomers is to listen to all this advice, and having politely thanked the donors, make a careful note of its text for future reference, then use his own discretion. After all he is an Experimenter and must therefore expect some of his experiments to be a failure; How could he learn if this were not the case.

After careful study of the following paragraphs the newcomer should be in a position to decide for himself the type of circuit most suitable for his purse and purpose. Any advice given by the writer is only intended, to act as a guide.

We will now deal with the Transmitter, Frequency Meter, and Receiver, in that order.

The Transmitter:—The main requisites of a Transmitter for telegraphic work are: stability, sharpness of emission, overall efficiency. These requirements are satisfied in a varying degree by different circuits and layouts.

Let us consider the various elements and units which go to make the whole, commencing with the most important unit. "The Oscillator" or "Basic Frequency Generator."

Oscillators:—All oscillators depend for their operation upon the energy fed back from the anode circuit to the control grid circuit. Expressed in another way, the feed back circuit by providing negative resistance equal in magnitude to the positive resistance, represented by circuit losses, causes continuous state of oscillation in the circuit as a whole.

Oscillators are divided broadly into two groups: "Self-Controlled" and "Crystal Controlled" oscillators. In the former type the frequency of oscillation is determined by the circuit constants; whilst in the latter an electro-mechanical device, better known as a Piezo-electric crystal, is employed to determine the frequency of operation. Both these groups of oscillators may be divided into different types. Some of the commonly known circuits are: the Hartley, Colpitts, T.P.T.G., Electron Coupled and Tritet—each has its particular advantages and disadvantages—broadly speaking the type of oscillator to be used should be determined by requirements and not by prejudice.

Series or Shunt Feed:—All anode and grid circuits may be either "shunt" or "series" fed—the latter has the advantage of simplicity and lacks the parallel loss path

introduced by the "choke" in the former circuit; however, in some cases it is most desirable to keep the D.C. out of the tank circuit; therefore we must resort to shunt feeding and ensure that the choke employed is designed to give minimum power loss at the operating frequencies. The natural period of the choke should be at least 20% lower than that of the lowest operating frequency to be used. Where a wide range of frequencies is to be employed, the choke should consist of a number of separate "pies" in series, each pie having a higher natural period than its predecessor. The ratio of one pie to another should not be an exact integer, that is, they should not bear harmonic relationship.

The "Tank" Circuit:—This name has become rather aptly associated with the tuned circuit. A most appropriate title in view of the fact that this circuit acts as a reservoir of r.f. energy in a similar fashion to the mechanical flywheel. The energy storage effect of the tank is termed the "flywheel effect."—Just as the "flywheel effect" smooths out the pulses of energy due to the explosions in the cylinders of the internal combustion engine, so does the same effect smooth out the pulses of energy supplied by the valve in the electronic circuit. Smoothing out has the effect of reducing the harmonic content and improving stability: Hence, a tank-circuit having a large ratio of Inductance to Capacity (Low C) is equivalent to a light flywheel, while the converse (High C) corresponds to a heavy flywheel. Obviously the heavier the flywheel, the smoother the resultant motion of the machine or analogously, the lower the harmonic content in the wave.

Figure 2 depicts, in graphical form, an easy method of arriving at the optimum L-C Ratio.

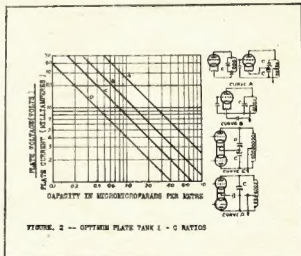


FIGURE 2 — OPTIMUM PLATE TANK L - C RATIOS

Tuning Condensers:—should be carefully selected to suit power and frequency employed. Dielectric losses in the insulation employed can reduce operating efficiency considerably, therefore, when choosing condensers for U.H.F. or V.H.F. operation, insist on low loss insulation such as, Mylex, Loaded Ebonite, Ceramic or Polystyrene.

Spacing of plates should be such as to enable capacitor

to withstand, Peak voltage applied, that is, D.C., plus R.F., plus Modulation (in the case of telephony). If the condenser is too large it represents poor space economy. One method of reducing space requirements of capacitor, and a very good one too, is to employ good Mica (preferably oil filled) condenser, to block D.C. out of tuning capacitor. The value of this series condenser should be at least ten times greater than the maximum capacity of the tuning condenser, otherwise, the effective range of latter will be considerably reduced, and the R.F. dissipation in the fixed capacitor will be unnecessarily high.

Split-Static Capacitors may be used to great advantage, particularly in neutralized and push-pull circuits. Apart from doubling the voltage rating, for a given spacing of the plates. The use of this type of capacitor removes the necessity of passing large r.f. currents through rotor bearings or brushes—pigtailed on earlier model condensers being impracticable at U.H.F. and V.H.F., owing to the inductance introduced by the pigtail or spring.

The use of fixed value of capacity in parallel with a small tuning capacitor is to be recommended. Not only does it permit the use of small sized tuning capacitors, but also provides Higher "Q" circuits and vernier control of frequency. On the other hand, a series capacity is also useful for reducing the effective range of large tuning capacitor, when restricted frequency coverage is desired.

When capacitors are operated at U.H.F. and V.H.F. "fringe effect" and "dielectric heating" become problems of a major nature; therefore when ordering special or standard capacitors specify:—

- (1) Operating Frequency.
- (2) R.F. Current.
- (3) D.C. Voltage.
- (4) Modulation Voltage, if any.

Where standard units are to be operated at more than 75 per cent. of their maximum rating, it is advisable to employ two units, each having twice the storage capacity, in series. Another point which must be borne in mind is that, where capacitors are in series the distribution of r.f. voltage and power depends upon the ratio of their capacitance; thus, if one unit has ten times the capacity of the other, the larger unit will have only ten per cent. of r.f. voltage applied across it, and therefore from an r.f. viewpoint can be reduced in size accordingly. However, from D.C. angle, the distribution of voltage depends upon the ratio of the leakage resistance, so unless a resistor network is placed across each condenser, to stabilize D.C. drop across it, one unit may be called upon to withstand the full D.C. voltage if the other unit develops a bad leak.

By-pass and Blocking Condensers:—As their name implies these condensers serve as by-pass and blocking condensers respectively, or in other words, the former by-passes alternating currents to earth, whereas the latter pass them to the next stage or circuit, at the same time blocking the flow of direct current—the efficiency of a condenser as a by-pass depends upon, apart from the power factor, the ratio of its reactance to the reactance of other elements in the circuit, and it can be determined by using Ohm's Law for A.C. circuits.

Condensers for radio frequency applications should be non-inductive, and preferably of silvered-mica construction when a high degree of accuracy is called for, in the lower voltage range. Oil filled and "vacuum" capacitors are regularly employed in high voltage circuits.

One point worthy of note in connection with ultra-high-frequencies is that, the length of leads necessary to connect a large capacitor introduce undesirable inductance, and in many cases it is necessary to employ a small parallel capacitor with short leads to shunt out this effect.

Earths:—A most important point which must be given very careful consideration when laying out and wiring up equipment, is the disposition of earthing points. In general a single earth point should be employed for each circuit, unless empirical results indicate that extra

points are necessary to balance out inherent instability or parasitics. Most particularly it must be emphasized that, on no account should D.C. or A.C. circuits be permitted to use chassis or wiring shields as a return path.

Grid Leak Bias:—Many oscillator and amplifier circuits, employ what is known as "grid-leak-bias," that is, a resistor is inserted in the grid circuit. During that portion of the cycle when the grid is driven, positive current flows in the grid cathode circuit, this rectified current flows through the grid resistor causing a negative standing bias to appear at the grid.

The value of this bias is determined by the value of the resistor in Ohms multiplied by the D.C. grid-current in Amps; e.g., 10,000 Ohms x 0.020 Amps equals 200 Volts.

A variable grid-leak is a valuable adjunct to a self-oscillator, as by adjusting its value to the optimum we may secure maximum output consistent with "a good note" or "clean keying" and high efficiency.

Piezo-Electric-Crystal:—The writer does not propose to deal with this subject at any length because it warrants a separate study; however, one or two cautionary remarks would not be out of place.

Firstly, "X" and "Y" cut crystals which were used so widely before the War are now as obsolete as the "penny-farthing bicycle," so be wise when ordering a new crystal, get the "gen" on the latest cut and order accordingly.

Secondly, variations in ambient temperature alter the operating frequency of the crystal to an extent dependant upon the characteristics of the crystal. Moral, reduce this factor to a minimum by controlling or reducing changes in ambient temperature.

Thirdly, don't overpower the crystal by trying to use it in a circuit employing high powered "bottles" and high anode voltages. Results may be spectacular; but, they are more likely to be disastrous, that is, the crystal may fracture if the crystal current is excessive—anyway stability is considerably reduced.

Fourthly, don't try to draw power from a crystal oscillator which you expect to be stable—treat it as a "generator of basic frequency" and rely upon the following amplifiers to supply power output required.

Fifthly, a small variable capacitor between the grid and cathode will enable the frequency of the oscillator to be adjusted readily over a narrow band. Furthermore, such a capacity usually stops the tendency of certain valves to oscillate when the crystal is removed.


Last but not least, if you must insist on using holders of the home-made unsealed variety—then, take every precaution to keep the plates of holder, and the crystal, free from oil, grit and verdigris—use carbon-tetrachloride or alcohol.

Filament Centre-Tap:—In the case of filament type tubes it is necessary to return the grid and anode circuits in some way to the filament. One method of so doing, is to employ centre-tapped transformer winding—this has two disadvantages, they are:—

- (1) It is necessary to employ a separate winding for each tube employing a resistor in the circuit to provide bias.
- (2) The centre of transformer winding, that is, equi-voltage point, is not necessarily the electric-magnetic centre of the filament circuit; hence, hum is present in the output circuit.

The better method is to employ a shunt resistor with adjustable centre-tap, which may be moved to reduce hum to a minimum. The resistor should, unless the demands of a particular circuit call for a lower value, have a resistance of ten times that of the filament, that is, wastage of power is limited to ten per cent. of the filament consumption; furthermore, it should be capable of carrying both the current due to the applied filament voltage and half the cathode current—Yes, only half the current! Why? because one half of the cathode current passes through each side of the resistor, as that particular end

ANNOUNCEMENT !!




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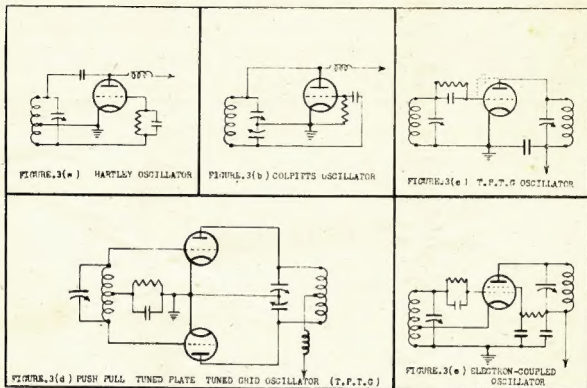
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of the filament becomes positive—once again the story of electrons taking the path of least resistance.

Typical Self-Controlled Oscillator Circuits:—Fig. 3 shows the following circuits in the order given: (a) Hartley, (b) Colpitts, (c) T.P.T.G. (single-ended), (d) Push-Pull T.P.T.G., and (e) Electron-Coupled. Now to consider each in turn:—

Hartley Oscillator:—In this circuit the extremities of the tank circuit are connected to the grid and plate. A tapping is taken to the cathode, or earth, at a point determined by excitation requirements, that is, tap is moved nearer to the plate end to increase the excitation, thereby introducing more turns into the grid circuit—excitation is reduced by moving the tap in the opposite direction—in general, tap will be located between points where 50 to 85 per cent. of the total turns are in the grid circuit.

In view of the fact that distributed and tube capacities affect the frequency, it is essential to ensure that these factors are as stable as possible.

Colpitts Oscillator:—The major difference between the Hartley and Colpitts Oscillators is that, the latter employs tapped capacity connection as cathode return instead of tapping on inductance. Thus by arranging two variable condensers of optimum ratio in tandem, and having plates shaped to give desired effect, the Colpitts oscillator may be employed to give constant output from one end of capacity range to the other.

Tuned Plate Tuned Grid Oscillators (T.P.T.G.) (single-ended):—The most notable feature of this type of oscillator is that it employs two tuned circuits, one is connected in the plate and the other in the control grid circuit.

Coupling between the two circuits is provided by the inter-electrode capacity of the valve, or where this is insufficient, a small external capacity connected between the grid and plate of the valve.

The operating frequency is chiefly controlled by the constants of the tuned circuit connected to the plate; but is varied to a certain extent by the tuned circuit associated with the grid, however, the chief function of the latter is to control the excitation—for optimum operating condition it is adjusted to a slightly lower frequency than that of the anode circuit.

Push Pull T.P.T.G. Oscillator:—operates in the same manner as the single-ended version, but has the advantage of greater stability, due to the push pull action of the valves cancelling certain inherent defects, improving flywheel effect, and balancing out even harmonics.

The Electron Coupled Oscillator:—employs the Hartley circuit using a tetrode or penthode type valve. The screen grid acts as the plate circuit of the oscillator, while the normal anode circuit of the valve acts as isolation or buffer amplifier. In this case the cathode is tapped on to the single inductor used, at a point representing 35 per cent. of turns, as viewed from the grounded end of the coil.

On the whole this circuit provides a very stable frequency source and, apart from the more complicated bridge oscillator, is the answer to the Ham's prayer. This circuit also has definite advantages when one contemplates both crystal and self controlled operation with the same oscillator, as will be seen when the subject is covered during the discussion of practical application in a later section.

PROPAGATION PREDICTIONS FOR JUNE

The following predictions are condensed from the Radio Propagation Bulletin for June (A.R.P.C.—18), published by the Radio Research Board for the Australian Radio Propagation Committee. Copies of the Bulletin are available from Newsagents and Booksellers, priced 2/-.

Zone E.—Latitude 10 degrees South.—(Nth. Queensland, Northern Territory, Nth. Western Australia).

28 mC is effective for skip distances of 2500 miles from 0730 to 1800 local time at point of reflection. These predictions are made with the understanding that the point of reflection is in E zone between latitude 5 deg. South and 15 deg. South.

Zone E.—Latitude 20 degrees South.—(Southern Queensland, New South Wales, South Australia, Western Australia).

Skip distance is 2500 miles on 28 mC between the hours of 0950 and 1020 in this zone. Reflection point must be in E zone between latitudes 15 deg. South and 25 deg. South. For shorter skip distances (1200-2000 miles) 28 mC is useable between 1000 and 1500 local time.

Zone E.—Latitude 30 degrees South.—(Victoria, Southern New South Wales, Southern South Australia, Southern West Australia).

28 mC useable between 1100 and 1600 for skip distances of 2500 miles. Reflection point in E zone between 25 deg. South and 35 deg. South. This reading is given as the maximum useable frequency.

Editorial

While the Divisions have their hands full with domestic problems, your Federal Executive has two main tasks to perform. Firstly, to obtain as speedily as possible, the restoration of our pre-war privileges and where appropriate to seek the introduction of new ones covering the V.H.F. and S.H.F. regions. The retiring Federal Executive have done a fine job and with the helpful co-operation of the P.M.G. Department, we are already some distance down the road. Our task is merely to pick up where they have left off and follow the clear line of direction given by the Federal Council at the recent Convention. The Federal Executive's other main responsibility for the forthcoming twelve months, is to carry out the Federal Council's directions on Federal Organisation, the two prime factors of which are the revision of the Constitution and taking over "Amateur Radio" from the Victorian Division as a Federal Activity.

We have a full and busy year ahead. We enter it confident and hopeful that when the Divisions and Federal Executive assemble their representatives at the Federal Council table a year hence, all will feel a sense of satisfaction borne of the knowledge that the hopes of twelve months before have been turned into accomplishments.

V.E.M.

Zone E.—Latitude 40 degrees South.—(Tasmania).

Conditions in 28 mC in this zone are still not conducive to long distance working. The maximum useable frequency given is 26 mC.

Readers are asked to note that the above data is given for single hop working. For those interested in working out the best conditions and frequencies for multi-hop paths, a study of the Bulletin is recommended.



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THE FEDERAL CONVENTION

The Sixteenth Federal Convention of the Wireless Institute of Australia, was opened at the rooms of the Victorian Division at 2.15 p.m., on Friday, 19th April, 1946. The first Convention since 1939, this was probably the most important in the history of the W.I.A., certainly it was a very representative gathering, and the business listed for discussion was handled in a manner reflecting great credit upon each and every delegate.

Present as Delegates were:

N.S.W., Mr. J. B. Corbin, VK2YC; Vic., Mr. J. G. Marsland, VK3NY; Q'land, Mr. F. W. Nolan, VK4JU; S.A., Mr. E. A. Barbier, VK5MD; W.A., Major J. Squires, VK6JS; Tas., Mr. A. Morrisbey, VK7VJ; F.H.Q., Mr. R. J. Marriott, VK8SI.



COUNCILLORS AND FEDERAL EXECUTIVE.

Standing: J. G. Marsland, VK3NY; J. B. Corbin, VK2YC; E. A. Barbier, VK5MD; A. Brown, VK3CX; R. J. Marriott, VK8SI; J. Moyle, VK2JU; Major J. Squires, VK6JS.
Front: A. Morrisbey, VK7VJ; C. C. Quin, VK3WQ; T. D. Hogan, VK3HX; F. Nolan, VK4JU.

Also in attendance were the Federal Secretary, Mr. A. H. Clyne; the Assistant Federal Secretary, Mr. C. C. Quin; the Federal Treasurer, Mr. T. D. Hogan; Federal Councillor Vaughan Marshall, and as Observer for the N.S.W. Division, Mr. J. M. Moyle, VK2JU.

Mr. Vaughan Marshall, on behalf of the Federal Executive, welcomed the visitors, and following on the reply made on behalf of the Delegates by Mr. Barbier, nominations were called for the position of Chairman, to which Mr. Marriott was appointed.

First business of the Convention was the presentation of the Annual Report and Financial Statement, which were published in these columns last month, following which the Convention proceeded to discussion of the Agenda Items. Listed first, as being the most important business were those items dealing with the general organisation of the W.I.A.

It was agreed that revision of the Federal Constitution was necessary, and that this should be carried out by the process of comment by the Divisions made on drafts to be submitted by Federal Executive. It is hoped that by this means it will be possible for a new Federal Constitution to be ready for ratification at the next Federal Convention.

It was agreed also that F.H.Q. should remain in Melbourne so long as the office of the Chief Inspector is located there, obviously F.H.Q. must function in fairly close liaison with the Chief Inspector, and for this to be done with any measure of success, personal contact is a prerequisite.

The Federal Convention recognised the desirability of the adoption of a uniform Constitution by the Divisions.

When items concerning Contests came up for discussion, it was decided that F.H.Q. should organise a DX Contest to be held in 1946, irrespective of the frequencies available. In this connection it was agreed that New South Wales should be authorised to organise the 1948 DX Contest, in view of the projected World Convention to be held in Sydney in that year.

In order to perpetuate the names of Amateurs who lost their lives in the service of this country, during the recent war, it was decided that a memorial DX Contest should be organised and that the names of these Amateurs should be carried on what ever trophy is to be awarded.

As a result of discussion at this Convention a "Worked-all-States" Certificate is to be issued for interstate communication on all frequencies above the 28 Mc/s band.

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and in addition a trophy will be awarded to the first Amateur to perform this feat. Also a National Field Day will be organised, covering all available bands.

Turning to consideration of Membership Certificates and Badges, it was agreed that in future this should be undertaken by F.H.Q. and this body was also instructed to consider the adoption of a standard design for members' stationery, log books, etc.

At this point in the proceedings, the magazine "Amateur Radio" was listed for discussion. Mr. Marsland gave a summary of the history of the magazine and placed before the Convention figures relating to circulation and finances with particular reference to the period since October last, when publication of the printed magazine was resumed.

Following considerable discussion regarding the future of the magazine, it was decided that "Amateur Radio" should become the sole responsibility of the Federal Council, and the Executive was instructed to negotiate with the present proprietors, the Victorian Division, with a view to acquiring the Magazine. In order to ensure a reasonable inflow of notes and contributions, it was agreed that each Division should appoint a Liaison Officer, whose responsibility it would be to see that the Divisional notes and at least one technical article per month are forwarded.

With a view to publicity, F.H.Q. was instructed to complete a census of Amateur activity during the war and to give the results all possible publicity.

Dissatisfaction was expressed with the new rules proposed by the A.R.R.L. for the DX Century Club, inasmuch as it is proposed to start the Club from scratch again; also it was agreed that steps should be taken to enable F.H.Q. to become the authority to verify applications for various certificates awarded by overseas bodies.

The Convention spent considerable time in discussion of the new F.M.G. Regulations, and it was decided to seek certain changes, notably for a return to one-class licen-

cing, and re-introduction of the 16 years minimum age provision. An increase in power is also to be sought, likewise the return of Amateur frequencies now held by the Services, and approval for the use of F.M. Television, Pulse and Facsimile transmissions above 100 Mc/s. It was also considered desirable to explore the possibility of regaining our harmonically related bands.

Unanimous disapproval was expressed concerning Section 62, of the 1946 edition of the P.M.G.'s Handbook (which prohibits the incorporation in a power supply of components capable of being used to increase the transmitter power beyond that authorised) and F.H.Q. was instructed to seek its deletion.

Permission is to be sought for the handling of official W.I.A. information over an official W.I.A. station in each State; it is felt that such an arrangement would be of inestimable value to seek its deletion.

The Convention decided that negotiations should be opened with the P.M.G.'s Department to secure a more equitable policy in respect of R.C.L. interference, and that the Department be requested to define its policy in regard to machine-made interference.

It was decided to re-open negotiations for the removal or reduction of duty payable on all imported Amateur gear not intended for re-sale, and for the granting of import licences where necessary.

The consideration of the Agenda was concluded with the passage of resolutions fixing the venue of the next Federal Convention—Melbourne was decided upon—and providing for the publication in this issue of the Convention proceedings.

During the foregoing business the Chairman had requested submission of items for consideration as General Business, fifteen items were submitted and all were, after discussion, carried unanimously.

Continued on Page 17.

RED LINE EQUIPMENT

A Complete Range of Transformers and Chokes

These Transformers and Chokes are of particular interest to the Radio Amateur. Precisely designed and made, similar material was used extensively by the fighting forces, and gave consistent satisfaction under very difficult conditions. Special orders can now be undertaken.

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CRYSTAL CONTROLS FOR V.H.F. BANDS

Quartz Crystals for frequency control have come to be accepted as necessities by most Amateurs, so much so, that most Hams are apt to give little more than a passing thought to this most important part of their rig.

During world war 2, communications played a very large part in achieving the victory. Only when the exacting requirements of service conditions made themselves manifest was it realised how important was the necessity for extreme frequency stability of transmissions. Consequently, the various services were quick to lay down specifications which were worked out after due considerations of all the factors involved. As a result very considerable advances in the science of Quartz Crystal production have been made, and we as Amateurs should be prepared to take advantage of these new developments.

When the crystal was first introduced as a means of controlling frequency it was thought that the ultimate had been reached in stability; never more would trouble be experienced from unstable transmissions; ended for all time was the bugbear of an operator having to chase a station all over the dial of his receiver. To a certain extent this was true, for the frequencies then in use were comparatively low, but as the use of higher frequencies became more popular it was realised that the state of affairs was not so happy.

Modern Crystals.

Two factors govern the requirements of a crystal for use in Amateur transmitters (or any other transmitter for that matter):—

- (1) Accuracy of calibration.
- (2) Temperature Co-efficient.

The first named is a function of the mechanical accuracy to which the crystal is ground. Here great strides have been made by the use of the etching process for crystal finishing. Not only is it extremely difficult to finish a crystal to extreme accuracy by abrasive lapping, but more serious still is the effect of aging. When crystals are finished by the abrasive method it is not always possible to remove every trace of the abrasive compound from the surfaces of the finished crystal, with the result that whilst the crystal is in operation, and in most cases oscillating vigorously, the process of lapping goes on with the result that before very long the frequency has been increased. It is common practice these days to "etch" finish a crystal to frequency. The blanks are usually lapped by the old abrasive method to within a few kC of the finished frequency and then immersed in hydrofluoric acid until the desired frequency is reached. Not only is it easier to control the etching process, but also the surfaces of the crystal which have become impregnated with abrasive are eaten away and the abrasive action completely stopped.

Furthermore the type of holder used also has an effect upon the operating frequency and must be taken into consideration.

The second consideration, that of temperature co-efficient is not dependant upon the accuracy to which the crystal is ground, but rather upon the selection of the cut of the crystal. As most Hams know, several modes of vibration are found in the quartz "mother." The thickness of the crystal for a given frequency is dependant to a large degree upon which cut is used, as is also the temperature co-efficient.

The earliest known cuts (X cuts) have temperature co-efficients of the order of 20 to 30 cycles per Mc., per degree Centigrade. That is to say that for every degree centigrade change in the ambient temperature of the

crystal, there will be a frequency change of 20 to 30 cycles for every megacycle of the frequency to which the crystal is ground. For instance, taking the extreme case of 30 cycles drift, on a 7mC crystal there would be a drift of 210 cycles for every degree change in temperature. Now a rise of temperature to the order of 20 degrees C. is quite within the bounds of possibility within the first hour or so of operation of a transmitter starting from cold. Over this rise the drift would be 4200 cycles, which is quite serious enough on 7mC, but assumes all the proportions of a major catastrophe when the same crystal is used for quadrupling to 28Mc. Under these circumstances the drift would amount to 16,8kC. Rather staggering isn't it?

Fortunately for the lot of the V.H.F. man this unhappy state of affairs need not cause him any undue concern, for there are other cuts which exhibit a far less drift than this. These cuts, known by the following designations, AT, BT, CT, DT, and ET, are used for widely differing frequencies. In addition to these there are also the GT, MT; and NT cuts, about which more later.

The above low drift types actually exhibit a zero temperature co-efficient over a few degrees of temperature change, and under the worst possible conditions rarely more than 1 cycle per mC. per degree C.

It becomes quite obvious then that crystal control can be entirely practicable even on bands as high as 166-170 mC. To illustrate this a table for the various V.H.F. bands is given at the end of the article, and features suggested methods of frequency multiplication.

To revert to the aforementioned types of cuts, let us see for what purpose each is most suited.

The AT cut is most extensively used for low drift crystals ground to frequencies between 300 and 6000 kC or in megacycles .3 to 6 mC.

Above this frequency the crystal becomes rather thin (a 5mC. AT cut crystal measures 0.0132 inches) so use is made of the BT cut. BT cut crystals are normally used for frequencies 4.5 and 10 mC. CT and DT cuts are used for frequencies below 0.5 mC. These types are known as shear types and depend not upon thickness, but upon length and breadth for their modes of vibration.

Harmonic generating crystals are known as ET and FT cuts.

The GT cuts have a temperature co-efficient of less than 0.01 per cent., over a temperature change of 100 degrees C. At a certain ratio of length to width one mode of vibration has a zero temperature co-efficient, making it very useful for frequency standard crystals.

The MT cut can be used from 50 to 100 kC., whilst the NT cut is a low drift crystal for use in the range between 4 kC and 50 kC. These last two mentioned cuts are used for phase modulated transmitters.

So you can see from the foregoing that the technique of quartz crystal production has progressed considerably since the days of the X cut.

Hand in hand with these developments have been the advances made in the design of crystal holders. Pre-war Hams ideas of a holder for the most part consisted of a couple of pennies or discs of similar size and material, which were ground more or less flat and placed in a tube base. This method has probably been the cause of more broken crystals than enough. Cases have been recorded where the crystal has actually jumped out of such a contraption.

Two distinct types of holder are in common use to-day.

Announcement Extraordinary !

Messrs Stratton Ltd., Birmingham, England, have pleasure in advising Australian Radio Amateurs and Experimenters that "Eddystone" Components will again be available in the near future through their sole representatives:—

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They are:—

- (1) Pressure type.
- (2) Variable air gap type.

In addition to these, special types have been developed for particular applications.

The pressure type holder, in which the crystal is mounted between two plates which are maintained in contact with the crystals by means of a spring, is most suited for higher frequency crystals. The plates, or electrodes, to give them their proper designation, are relieved in the centre so that the crystal makes contact only on its extreme corners, thus providing an air gap. There are many variations of this type holder, to name two well known varieties, the DC11, which is designed to take 0.75 inch square crystals, and the FT243, which is the by now familiar miniature holder designed for use with 0.5 inch square crystals. Although the construction of these two

types varies somewhat, the principles by which they operate remain the same.

The variable air gap holder is most suited for the lower frequency crystals. Most types are adjusted in the laboratory for most satisfactory performance, but there is at least one well known type in which the air gap is externally controlled, giving a frequency variation of a few kilocycles on either side of the mean frequency. As a general rule crystals vary slightly when placed under pressure in a holder, so that for greatest satisfaction it is better to order them complete with holder.

If, by now, the reader (if he already did not do so), has begun to realise the futility of buying crystals of unknown or doubtful cut, this article will have served the purpose for which it was intended. With the likelihood of enormously increased occupancy of the Amateur bands there is no place for the signal that is not stable. Good crystals may cost a little more than poor ones, but will certainly pay dividends in the long run.

28 to 29 mC BAND.

Fundamental Frequency in kC/s.	7,025	7,050	7,100	7,150	7,200	7,225
Output from 1st Doubler	14,050	14,100	14,200	14,300	14,400	14,450
Output from 2nd Doubler	28,100	28,200	28,400	28,600	28,800	28,900

50 to 54 mC BAND.

Fundamental Frequency in kC/s.	6,262	6,300	6,400	6,500	6,700	6,737
Output from 1st Doubler	12,524	12,600	12,800	13,000	13,400	13,474
Output from 2nd Doubler	25,048	25,200	25,600	26,000	26,800	26,948
Output from 3rd Doubler	50,096	50,400	51,200	52,000	53,600	53,896

50 to 54 mC BAND.

Fundamental Frequency in kC/s.	8,350	8,400	8,500	8,600	8,800	8,980
Output from Tripler Stage	25,050	25,200	25,500	25,800	26,400	26,940
Output from Doubler Stage	50,100	50,400	51,000	51,600	52,800	53,880

166 to 178 mC BAND.

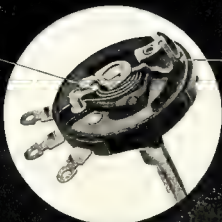
Fundamental Frequency in kC/s.	6,150	6,180	6,214	6,240	6,260	6,295
Output from 1st Tripler	18,450	18,540	18,642	18,720	18,780	18,885
Output from 2nd Tripler	55,350	55,620	55,926	56,160	56,340	56,655
Output from 3rd Tripler	166,050	166,860	167,778	168,480	169,020	169,965

Q U I E T

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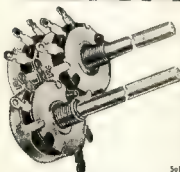
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"GRAPHICAL ANALYSIS OF RESISTANCE-COUPLED PENTODES."

At the annual meeting of the Adelaide Division of the Institution of Radio Engineers (Australia), Thursday 3rd. May, a gathering of sixty members was addressed by Mr. Langford-Smith, Applications Engineer of Amalgamated Wireless Valve Company Pty Limited on the above subject.

A selection of lantern slides were used to illustrate the results of tests carried out at the Valve Company's Applications Laboratory at Ashfield, N.S.W., and a short sound film, produced by the Radiotron Sales Production Department, depicted the assembly of a typical Australian made receiving valve (6F6G) at the Valve Company's Works.



W's ON EIGHTY

As from April 1st, U.S. Amateurs have been permitted to operate on the band 3.7—4.0 Mc. C.W. may be used throughout the entire band, but 'Phone must be restricted to the portion between 3.9 and 4.0 Mc.

In making this allocation the U.S. authorities have broken the agreement that International Frequency Bands will be released simultaneously in all countries, and whilst we wish our American cousins every success, we cannot but feel that the time is ripe for a complete revision of the position relative to the release of the lower frequency bands.



Connecting wires in radio receivers are eliminated by a method announced recently. Bare metal sprayed into channels in a plastic chassis is the basis for the method which, it is said, speeds production, reduces operating costs, permits lower prices and improves performance. The process has been used in many countries, notably in Germany where, during the war, the spray method was used in fabrication of coils.—Q.S.T.



The British G.P.O. are prepared to allow those interested in the radio control of models to use a frequency of 460.5 Mc/s for the purpose of emitting control pulses. The output from the transmitter must be limited to 5 watts. R S G B. Bulletin.

ON THE HIGHS

28-28 MEGACYCLES.

Apart from an occasional fade out for 24-48 hours conditions have been good during daylight hours, the band opening around 6 a.m. EST and closing around 8 p.m. EST.

DX contacts normally followed the daylight route, East Coast W's being first heard followed by Central and South Americans and then all North and South America coming through until noon, when West Coast W's and a few South Americans are workable up to 3.30 p.m. EST.

African contacts commenced about 3 p.m. EST and continued on good days until 8 p.m.

Europeans appeared as early as 3 p.m. and faded out around 8 p.m. with an occasional break through at 10 p.m. for an hour or so.

Asian and Oceania contacts were possible at any time during daylight and once in a while during the evening up to midnight.

SUIKE and several G's have been heard on rare occasions at 8 a.m. EST. Their signals being heard via SOUTH AMERICA.

AUSTRALIA.

Three element rotary beams are springing up everywhere with VK3IG holding the record for height—90 feet and VK3BW winning in the other division with good DX contacts on an 8 foot high array.

Among those using beams and getting their share of DX are VK's 38B, 3YH, 3CZ, 3NW, 3KU, 3KR, 3KX, 3OP, 3VU, 3BQ, 3CP, 3YP. Country Hams are being heard in Melbourne at reasonable strength and provide the most satisfactory contacts for beam tests, the most consistent being VK's 3JA, 3KX, 3SE, 3MC, 3KJ, and 3HG.

Information is scarce regarding Interstate Hams although all districts are heard regularly, reports to the

magazine will be appreciated as it is desired to make these notes representative of Australia.

NORTH AMERICA.

XEIKE, 28050 on cw is the old X1AY of early 10 mx fame.

CENTRAL AMERICA.

Numerous TGR's in Guatemala are active on fone and CW, the most consistent being TGRJW, TGRPB and TGR9C. TGRJW is using a 2 section 8JK beam and is usually S9. T12RC, 750 watts 28220KC fone and T12AW 28070 CW are best from Costa Rica.

VP6RB 28350 fone, and VP6PC 28000 fone and VP6JR 28750 fone, have been worked around 8 a.m. EST.

K4ESH 28050 CW is the most consistent Porto, Rican.

KZ5AW 28050 CW and KZ5AA 28040 put in good signals. KZ5AA is running 1 KW, the rig being 10 miles away and on the other side of the Panama Canal from the receiver. It is remote controlled over a pair of telephone wires and is keyed by a tone oscillator and a W.E. teletype relay which is so fast it follows the tone oscillator of the frequency, falls below 300 cps.

VP5EM Kingston, Jamaica has good fone. It is of interest to note that the old VP5PZ presented his 1KW rig to the Government during the war, the call ZQ1 being used. This Old Timer is at present in Canada and hopes to be back in Jamaica soon.

SOUTH AMERICAN.

The most consistent contact is PJ3X 28000 CW who is on every day around 10 a.m. EST.

OA4AS 28040 fone and CW has an ex-VK as assistant operator. His name is unknown but his present call is OA4V.

HK4AV 28180 fone is also consistent and HC1FG on 28000 fone is another regular.

VP3FL 28350 fone is heard regularly but has not yet been contacted.

Others heard include YV5AN 28030 CW, CX1FB 28025 CW, LU9AX 28060 CW, LU3DH 28020 CW, VP4TR 28075 CW.

AFRICA.

ZS and ZT stations heard and worked are too numerous to list but some of the consistent rarer ones are as follows:—FA8JD 28040 fone and answers CW calls; SUI1MW 28100 fone; VQ6MI 28050 CW; VQ3TOM 28040 CW and fone; VQ4AA; VQ2FL 28120 CW and fone; VQ2GW 28160, 28490 CW; CR7AD 28650 CW; OQ6AQ 28060 CW; OQ5BQ 28000 fone and CW; SUIKE.

ASIA.

VU7BR 28120 CW; Y12XG 28050 CW; VU2AA 28090 CW; VU2WP 28090 CW; XU1YA-XU1YZ 28000-29000 fone and CW; CA6AG 28120 CW; PK4BA 28220 fone.

EUROPE.

ZBZA cw; XACP cw; KABZ fone; D4AEx; D2DI, PA0UN; SV1EC fone or CW; EP1C; XADK fone; G2VV CW; D4ABQ fone.

The stations from the United States are rather a problem if one has hopes of DX in other directions and if your beam is on South America, unfortunately it passes through New Zealand with consequent S9 plus signals from that country especially the few ZL phones parked in the first 100 Kc of the band.

The most outstanding W signals are from W6POZ Galeta, California and W5AYH. The last named has possibly the highest Ham antenna in the world for it is 200 feet high and is a folded dipole mounted on stand-offs at the top of a grounded steel tower of the local BCL station. The feeder is a 600 ohm line up the centre of the tower.

From the country, VK3GD at Stanhope, reports success in the DX line. Using low power, 7 watts input to a

Continued on Page 17.

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Q.S.L. BUREAUX

The Federal and State Qsl Bureau have again commenced activities after the enforced period of hibernation during the war years. The following list shows the appointment of Qsl Managers for the various States, together with their respective addresses.

N.S.W. Division.—VK2YC, J. B. Corbin, 78 Maloney Street, Eastlakes, N.S.W.

Vic. Division.—VK3RJ, R. E. Jones, 23 Landale Street, Box Hill, Victoria.

Qld. Division.—VK4EN, Eric Neale, 38 Felix Street, Woolloowin, N.S., Brisbane, Queensland.

S.A. Division.—VK5RX, G. Luxton, 8 Brook Street, West Mitcham, S.A.

W.A. Division.—VK6RU, J. E. Rumble, Box F319, G.P.O., Perth, W.A.

Tas. Division.—VK7AL, T. A. Allen, 6 Thirza Street, Newtown, Tasmania.

The Federal Qsl Manager is pleased to renew working acquaintance with old Divisional Managers and extends a welcome to newly appointed Managers.

Owing to the anticipated increase in Qsl traffic, it has been decided by the Victorian Division to divide that State Bureau into two sections—for inward cards and for outward cards. Mr. Frank O'Dwyer has kindly offered to take charge of the outward section and all outward cards should be mailed or handed to VK3OF. His QRA is VK3OF, Mr. Frank O'Dwyer, 100 Thomas Street, Hampton, Victoria. The work of the bureau will be lightened by the division of work and the handling of cards thus expedited. VK3OF knows the game thoroughly by virtue of tuition from VK2YC and the writer and all users of the bureau are requested to extend him the same co-operation as it has been the writer's privilege to enjoy

since the founding of the bureau in Victoria in 1931. All despatches of outward cards to VK3OF should be accompanied by currency or stamps at the rate of 1d per card, and cards should be sorted into countries. All cards for VK3 stations should be sent to VK3RJ as usual.

An alphabetical list of Australian experimental licence holders together with addresses will be issued by the P.M.G. Department Wireless Branch, Treasury Gardens, Melbourne, at the end of June. It is expected that the list will be available as previously, on application accompanied by the fee. The pro-war fee was 2/6 per annum.

Addresses of overseas bureau will be published in these notes as information of their reactivation comes to hand.

Cards for VK3 stations will be held for a period of six months only, and as the family bath heater is now of the gas variety, some other form of combustion will surely be devised for cards unclaimed after the period stated.

Cards for Victorian stations will be distributed as under:—

W.I.A. Members.—At monthly meetings.

Country Members.—Posted monthly.

Non W.I.A. Members.—Cards will be forwarded on receipt of a stamped, addressed envelope (large size for preference).

A list of cards on hand will be published monthly in these notes.

Pirates.—Cards will be handed over by appointment (at the office of the R.I.).

Cards are on hand at the Victorian Bureau for the following stations VK3BC, CI, EE, EO, EZ, HE, IP, IW, JK, MC, NC, NF, NM, QN, SB, SE, TM, UP, UQ, VD, VJ, VU, YH, YR, YT, YW, ZL, ZT, ZU.

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Transconductance
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When ordering new supplies of cards from printers, ensure that the size conforms to that of the normal postcard envelope. Larger or smaller cards are a confounded nuisance.

Bureaux Managers Note. — If they desire to publish calls of Hams, for whom they are holding cards, please forward the information not later than the 18th of each month.—Editor

FEDERAL CONVENTION.

The items of General Business provided for: approach by F.H.Q. to the Chief Inspector for interpretation of Regulations, a ban on QSL cards bearing commercial matter, holding of all Divisional meetings in the same week of the month, a "CW only" sub-band in the 10 Meter band from 28.0-28.1 Mc/s, acceptance by all Divisions of the existing Federal Constitution, a telegraphic address for F.H.Q., an Emergency Communication Network, incorporation in each Divisional Constitution of a clause restricting voting power to members holding current experimental station licences, acquisition of an accurate Frequency Meter by each Division, full use in Institute publicity of the privileges of membership, amendment of the existing Federal Constitution to allow Federal Council to alter at its discretion the per capita contributions to Federal Funds, payment of visiting delegates travelling expenses from W.I.A. funds, a policy to be determined in the handling of QSL cards, amendment to the Federal Constitution to require replies from Divisions to F.H.Q. within fourteen days, and moves to be made to secure

greater representation on the Experimenters Advisory Committees.

At the conclusion of the above business, delegates expressed their appreciation of the hospitality extended by the Victorian Division, and Messrs. Marriott and Hogan in reply commented on the splendid spirit of co-operation, evident at the Convention, following which the Chairman declared the 1946 Federal Convention closed at 1 p.m. on Monday, 22nd April

ON THE HIGHS.

CV6, he has worked VK2, 4 and 6. His first contact was a W6, followed by ZL's VS3JH, G6ZO/L. George is not in favour of dividing the 10 mX band.

166-170 MEGACYCLES.

It seems that there are at least two stations working on this band in VK3. To quote VK3MB: "VK3TZ and myself are a bit tired of talking to ourselves on the 166-170 mc band and also of calling CQ, because either we aren't getting out far enough or no one is listening. We suspect the latter and have come to regard 14 metres as our own private telephone line for daily ragchews."

The gear being used are parallel rod oscillators and acorn or peanut tubes as super-regen detectors. Three element vertical beam antennas are being used.

VK3MB says that they hope to work over longer distances, and that he is thinking of taking a portable to Macedon to see how it works out.

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DIVISIONAL NOTES

NEW SOUTH WALES

Secretary: Peter H. Adams, VK2JX,
Box 1734 G.P.O. Sydney.

Meeting Place: Science House, Gloucester and Essex Streets.

Meeting Night: Fourth Friday of each month.

The Annual General Meeting of the Division was held at Science House, Gloucester Street, Sydney, on Friday, 28th April. There was an excellent attendance, among the visitors being VK4JU, on his way back from the Federal Convention, where he ably represented Queensland.

The official business of the meeting was the presentation of the Annual Report and financial statements, and the election of Council for the ensuing twelve months. The following seven members were elected:—W. M. Moore, VK2HZ; W. G. Ryan, VK2TI; J. M. Moyle, VK2JU; H. Peterson, VK2HP; G. W. Dukes, VK2WD; M. H. Meyers, VK2VN; and J. B. Corbin, VK2JB. Subsequently, this Council held its first meeting and Wal. Ryan, VK2TI, was elected President. Ex-Officio members of Council were also elected at this latter meeting, the appointments being:—Honorary Secretary, P. H. Adams, VK2JX; and Honorary Treasurer, G. Cole, VK2DI. Bill Dukes carries on as Membership Secretary.

At the general meeting there was considerable discussion on "break-in" and "duplex" operation, including the special case of "cross-band duplex." Of course, if the regulations are strictly interpreted, none of these forms of operation are permitted, but there are many who think that some provision should be made, especially for operation on the 50 mc and higher frequency bands. This is a matter which, we understand, was discussed at Convention, so no doubt there will be ample opportunity for further discussion at the next general meeting, when the official minutes of Convention should be available.

At the conclusion of general business a most interesting lecture on "Aerials" was delivered by A. H. Treharne, B.E., B.Sc., VK2IQ. Mr. Treharne dealt with all types of antennae and feed systems, including radar aerials, and covered a very wide field in the rather short time at his disposal.

The only thing he did not tell us was how to make W.A.C. on 28 Mc—but perhaps VK2TI could give us the best hope on that. The other day he worked CEIAO at 1315 and followed this with W2LWU, K6BHL, PAOU, XUIYY and finally FA8JD at 2000. He worked VK2DI for the Oceania contact, giving him W.A.C. in well under seven hours. Nice going, Wal! All this was done with a humble two-wave Zepp. He thinks he would do much better with a beam but for some obscure reason still sticks to the Zepp!

VK2RA still continues to raise those good ones that we can all hear so well. Ray has now worked 40 countries with the aid of a "WBJK" and, now, a V-Beam on Europe.

Rare ones heard lately are TG9CV and CR9AG, who incidentally will be remembered as VS6AG before the war.

What is your reaction, chaps, to an unofficial DX Honour Roll? It interested send in your lists of countries worked, including the call of station worked in each, and we'll list the first 20 each month. Don't send cards as this is purely unofficial and we'll take your word for it.

It is expected that FHQ will have something to say in this issue about the results of the deliberations at Convention, so there is no point in discussing them here. Council has had a brief unofficial report from our delegate, Jim Corbin, and it seems as though the foundations of a solid post-war W.I.A., thoroughly representative of the Australian amateur, have been well and truly laid.

It is indeed pleasing to know that the idea uppermost in the mind of every delegate was the constructive improvement of the Institute as a Federal body, capable of efficiently representing the amateur in Australia. This spirit of co-operation, so evident at the Convention, promises well for the future and we can confidently expect a better, stronger and more united W.I.A. than ever before.

One point arising out of the Convention is that the VK-2L-DX Contest will be held this year, irrespective of what bands are available. We mention this now so that you will have plenty of time to try out all those fancy 28Mc beam arrays and decide which ones suit your purpose best. Of course, a beam alone won't win the contest for you—the operator has to be good too! On the subject of operators—and signals—isn't it time we had a bit of a clean-up? There is no excuse for rotten signals these days—and you hear some pretty rotten ones, both C.W. and phone, from time to time. There seems to be a gentlemen's agreement that phone should not be used in the 28,000 to 28,100 kc. portion of the band, but evidently we are not all gentlemen. There is no point in sticking religiously to this rule on nights when no DX is coming through, but, during daylight hours in the week-ends, it should not be asking too much to leave 10% of the band free for C.W. Incidentally, the band has been extended to 30 Mc. for the G's who are also allowed to use ten watts on the band 1800-2000 kc.

Regarding the VHF bands, VK2VN supplies the following extract from an agreement between the United States and the British Commonwealth and Empire concerning frequency allocations in the region between 200 and 300 Mc.

"The Commonwealth and Empire agree that they will interpose no objection to activation by the U.S. of an interim amateur band 235 to 240 Mc and Canada agrees to take similar action in the interest of the radio amateurs of both countries. It is understood that, upon the expiration of this interim period, the amateur band, in both Canada and the U.S., will revert to 220-225 Mc."

Morris stated that the interim period referred to in the agreement is to terminate as soon as possible after the 1st January, 1948.

At the April General Meeting, a total of £8/10/- was handed in for the "Food for Britain" Fund. This is an excellent example of the real ham spirit.

VK2YC reports that the total cards received in the QSL Bureau since the bands were opened total about 150. Of these, foreign cards represented about 20 different stations, and of these twenty, eleven sent only a single card. So don't blame Jim if you haven't got cards from all those W's you've been working!

With normal conditions on 28 and 50 Mc it is very hard to keep track of the activities of country members. If you are on the air, drop a line to Box 1734 and tell us what you are doing; anything of general interest will be included in these notes.

Finally, remember that the general meetings are now held in the Main Lecture Hall at Science House, on the fourth Friday of each month and commence at 7.45 p.m. sharp. Coffee and biscuits are served at 10.30 and the lights go out at 11 p.m.

REPORT OF A.O.C.P. CLASSES.

Course No. 1.—Course No. 1 commenced at the premises of the Women's Emergency Signalling Corps, 10 Clarence Street, on Monday, 21st January, with 37 students. The duration of this course was fixed at three months, but after the course had been running for some time it became apparent that the full syllabus could not be covered in this time.

Accordingly, the class was held on one extra night per week, making three nights per week in all. The fees for this course were: £3/10/- for the complete course or alternatively £1/1/- application fee, the balance being paid in instalments. Of the 37 students, 17 paid the full amount in advance.

The writer was assisted by Mr. Hicks, VK2AD (Morse), and Mr. Piermont, VK2NQ (Theory and Morse), but Mr. Piermont found it necessary to relinquish his duties on 18th February. The course finished on Monday, 8th April, with 30 students, 12 of whom sat for the April A.O.C.P. Examination, the results of which are not yet known.

A two stage "Bread Board" transmitter was built and used for demonstration purposes, the components being supplied by Mr. W. G. Ryan. A visit to the transmitter of Station 2UE was arranged, and was attended by 10 students. A good deal of assistance in the Morse instruction was given by Mrs. F. V. McKenzie and her staff.

The class rooms leave a great deal to be desired but it appears that nothing can be done about this at the moment due to the difficulty of obtaining accommodation elsewhere.

Course No. 2.—As a result of discussion at the March Council Meeting, it was decided to increase the duration to 19 weeks, and the fees to £8/6/-. An advertisement was inserted in the March issue of "Radio & Hobbies," and from this 66 inquiries were received requesting details of the course.

A printed pamphlet setting out the full details was forwarded to each metropolitan inquirer, and explanatory letters were sent to inquirers from other States and country towns (10).

To date 28 application forms have been completed and returned, of which 8 have paid the full fees in advance.

Three of these were members of the last course, but it is expected that there will be a few more when the results of the examination become available.

More demonstration equipment is being constructed, and members of the Institute could undoubtedly assist greatly in this regard, by loaning certain items of equipment, such as receivers, frequency meters, burnt out valves, etc., to the class for short periods during this course.

VICTORIA

Secretary: R. A. C. Anderson, VK3WY.

Box 2611 W. G.P.O., Melbourne. WM 1579.

Meeting Place: Lecture Hall, Chamber of Manufacturers' Building, 312 Flinders Street, City.

Meeting Night: First Tuesday of each month.

The May meeting of this Division was held in an atmosphere of comfort, dignity and ease, worthy of some record after the inconvenience, tolerated in good spirit, during the past several months owing to inadequate space of the W.I.A. Headquarters. We hope to hear of further good news in this respect soon, so ears to the ground "Gents" and keep reading the Public Notices in the "Age" each Saturday.

This meeting was a huge success, and one of the best held for many years. There were over 150 members and visitors present and seated, about ten standing (Sorry fellows), so come early next time.

Bob Cunningham, 3ML, commanded the chair and welcomed visitors and notably FBS1.

Ray Jones, VK3RJ, the inward Q.S.L. manager distributed cards.

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JUNE ISSUE: Full constructional details of a Crystal-controlled Transmitter for the 50 megacycle (6 metre) band.

PUBLISHED BY A. G. HULL, 336 WAVERLEY ROAD, S.E.5, VICTORIA

Jim Marsland, VK3NY (Vic. Div. Federal Convention Delegate), gave advance information on doings of the Convention.

There was further discussion, which was in the nature of persuasion to Station operators to confine 28 Mc/s to 28.1 Mc/s for CW, and fone stations to operate in any of the remainder of the band. There seems to be the general agreement that fone stations should be Q.R.T. on frequencies between these two limits on 28 Mc/s band.

The highlight to the night, was a very interesting lecture on the principals and application of Radar, very capably given by Vaughan Marshall, VK3UK.

Some embarrassment has been caused by inaccuracies in these notes and your correspondent desires it made clear that some can happen unwittingly, as these notes are compiled from notes hurriedly made at meetings (not in shorthand) and from voices fitted with rubber heels. Its pretty hard to keep up sometimes.

The Council of this Division has decided to discontinue "service rate" subscriptions for membership as from July 1st, 1946. Approval has also been given for the purchase of a Philscope for the Lab. Committee and members convenience.

Ray Jones, 3RJ, Membership Secretary, reports that there is a slight lull in his activities as such and finds a little time now for blowing up an occasional crystal between QSO's

New member, G. A. Oxley.

Further justification for ears to ground, particularly country members, is the possibility very soon of Special Notice in Public Notices of Saturday's "Age." Keep your cheque books handy Gents. The shipping strike is now over and things will move fast from Sydney.

IN THE WESTERN ZONE,—8JA.—Getting out well with 20 meter V beams, has WAC and 28 countries so far. Finds new 9 tube receiver much better than old TRF job. **3MC.**—Jamie swears by vertical radiators but has recently been converted to three element rotaries and is busy building a supporting tower. Countries worked total 80 but still wants 5th. America for WAC. But is doing very well for a new comer on the air. **3NC.**—Norm., who is old SPG of QRP fame, still sticks to low power. Is using a vibrator pack and about 8 watts input to a V beam. Getting out fairly well, but the two tube receiver not performing up to requirements. Intends putting up a rhombic on Europe. **3HG.**—Now has rotary three element going nicely and getting share of D.X. Now has 30 countries including South America. **8KX.**—Nuff sad. Everyone knows how Ron works em. **3KJ.**—Hear Doug with nice signal occasionally but no news of what he is working. **3TW.**—Still seems to have a new rig every other day, but in between times works quite a bit of D.X. **3JX.**—Has a new receiver parking nicely on ten, but has not completed the Xmitter yet. **3YN.**—Another newcomer, has a six stage rig, a 18 tube receiver and is sure getting out. Was heard working a "D" the other day. **3TN.**—Having a spot of bother with the mixer in the receiver. Will have another newcomer in Hamilton, as Bruce Learmonth, passed at the last exam. and will be on the air in the next week or two. Quite a lot of the D.X. heard here has been going back to 6BF, an old friend of the 40 meter days. Congratulations Frank, the boys are anxious to work you again when the bands permit.

AT STAWELL.—The local gang here consists of 3US, 3AKP, and myself, 3YW, in our suburb of Ararat we have 3GN and 3PJ (ex-3WC), and out in the bush is 3HL.

3US at present has an E.C.O. working into a single wire fed 40' meter aerial, last heard of he had departed for VIM to collect a Xtl and a 807, Syd is using a Jones Super-Gainer for a Rx and finds it very fb. 3AKP is at present moving into a new house and worrying just where the antenna is going, will probably end up with a vertical. Keith was using two trannies in series for his power supply, one night there was a sizzle and then there were one. Me, well I have been pumping 40 watts into a vertical two half wave in phase and find them very FB, however, since the threat of local QRM has loomed larger I have put a reflector behind the antenna with the usual results. 3HL has not even opened his boxes of gear yet, but threatens to get busy (perhaps) when the crop is in. I wonder why Charlie Nelson changed his call to 3FJ, anyway he will be off soon, the Tx is just panting to go, the Rx ticking over, and the sticks rose from their beds recently. 3GN had bother in finding that elusive 25mc spot (lots of us did I guess) after borrowing my Wave meter, however, he got there, but I believe has been having trouble with the super.

QUEENSLAND

Secretary: C. Marley, VK4CJ,
Box 638 J. G.P.O., Brisbane.

Meeting Place: State Service Building, Elizabeth St., City.

Meeting Night: First Friday of each month.

Just by way of a change this month we won't discuss the last G.M., except to say that it was decided to hold a "Field Day" on the weekend following the next meeting. The idea is for the Gang to spread out on the best 10 mx sites near Brisbane and proceed to work all and sundry. We expect to camp out on the Saturday night and make a weekend of it. Ten metres will of course be the band used, and it should prove a good show. The winner will receive a dozen bottles brown liquid and two HK64's. The winner won't, as you might think, be the fellow with the highest score. No, he'll be the chap who lends me that extra blanket if I'm cold. Don't mind us, folks—it sounds good and our intentions are the best. Providing we're not frozen stiff, the affair will duly be reported in these pages.

Of interest to our country men, the library service is likely to be renewed at an early date—more later. And that reminds us, speaking of country men, we received a couple of pages of juice from 4DK, up in Columboola. Following considerable procrastination, we're told, Jack advises of his activities over the last five or six months and painted a most realistic picture of himself and the 2nd op., George, sorting out the radio gear from bags of chaff and poultry feed. At all events a t.r.f. receiver is now in operation and a rig is due to materialize at any tick of the clock. The fly in the ointment of course, is the lack of A.C. Glad to hear from you Om and best of luck.

Ten metres in Brisbane, towards the end of April, has been rather erratic (pardon us—more erratic than ever!) with signals sometimes lasting only a few seconds. 4SN in Merengenden is rather disgusted with the band for the same reason. Must remember to dust those 20 mx coils once again!

After hearing (and seeing) the performance of the new 10 mx Rotary at 4KS several of the local gang won't be happy until they've got one of their own. It's a 3 element job and although everyone knows that the things do work, there's nothing like a demonstration to convince the skeptics.

We fear that a grave injustice was done to 4HR in last month's notes. It was erroneously reported that Tibby had worked 26 countries since again getting his haywire cranked up. Friends, the number should have been 36.

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Speaking of DX worked, why not run a column in "AR," giving the 12 or so highest scores in Australia. The thing would only include those countries worked since the lifting of the ban, and it would be interesting to see who's leading who from month to month. What say, Mr. Editor, if you are after something to put in the magazine?

In case some of our members are not aware of the fact, we would like to advise that the QSL Bureau is functioning under the able care of 4EN, so forward your cards to Box 638J G.P.O., and Eric will attend to them. A visitor to the last meeting was 4LP, back from Darwin to get his discharge from the R.A.A.F. Looking very well on it too! Another unfamiliar face was that of Bill Faber, 4WF. Glad to have you with us Oms!

Called on 4HU on a recent Sunday morning and found George laying a path in the front garden. Doesn't know where he got the time for Ham Radio before the war, he says. Bill Petersen, 4FY, putting out a very FB signal on 10—that mink you're using sure gives a faithful reproduction of your voice Om. And then, when we're tuning across the band and the receiver suddenly goes dead we know that we are right on 4JP's carrier. Likewise with 4ES. Incidentally Herb finds his co-axial vertical half-wave on 10 mx the goods for sucking up the soup. 4ZU is hoping his will do the same on 6 mx.

In order to break the meeting monotony, it has been decided to hold the next couple of council meetings at home of 4HR, who is bed ridden (for a month or two) with a fortunately not painful complaint. Needless to say, Tibby has the rig alongside the bed!

A rare signal heard in Brisbane, by several of the locals, was that of 4WS up in Ipswich. Just why you are the only Ipswich man to be heard Om, we don't quite know.

Following his visit to VK3 for the Convention, our delegate, 4JU, delivered a comprehensive account of the proceedings to Council at last night's meeting (10th May).

Our members will be pleased to know that Frank did a good job for VK4 at the Convention.

Following the finish of business at General Meetings, it has been the custom for the boys to drift away to various near-by cafes for supper. To stop the party from breaking up in this fashion we intend turning in Refreshments at future General Meetings.

SOUTH AUSTRALIA

Secretary: E. A. Barbier, VK5MD.
Box 1234 K, G.P.O., Adelaide.

Meeting Place: 17 Waymouth Street, Adelaide

Meeting Night: Second Tuesday of each month

The Monthly General Meeting of this Division took place on Tuesday, 14th June. As the Institute's usual rooms were not available, members met at the Institute Building, North Terrace, where the Vacuum Oil Co. had kindly arranged a very attractive program of talkie pictures. On the grounds that the Amateur's activities should be balanced and that he take an interest in other things besides his chosen hobby, a brief outline of the subject matter of the films is given. One picture showed the work done by the Tennessee Valley Authority, in the United States, to combat soil erosion and restore the land to fertility and production. The river was dammed in many places to curb its boisterous waters during flood periods, also to provide hydro-electric power and for irrigation. In addition, farmers had to be persuaded to try new methods. One outstanding example of this and of particular interest to us here in Australia, was contour plowing, where the furrows, instead of being plowed straight, follow the contours of the land, the idea being to prevent the formation of channels down a hill where

the water would wash away the soil. The whole project was on an immense scale.

Another film dealt with the construction of an oil pipe line from the Texas Oil fields to the East Coast, a distance of over 1300 miles. This was a war necessity, as there were an insufficient number of tankers available for transport, by the usual sea route, to cope with the increased demand. Unlike our own Whyalla pipe line, which is a surface job, these pipes were laid underground. The outside of the pipes were bitumized and then covered with protective wrappings put on by a tractor crawling along the top of the pipes whilst they were supported above ground.

As an experimental departure from the usual lecture on a radio subject, the picture evening was a very pleasant and instructive diversion.

Items of general business were attended to at the conclusion of the entertainment. Nominations for next (financial) year's Council were announced as being just sufficient to fill all positions. There will thus be no need for a ballot.

Mr. John Allan (VK5UL) presented his interpretations of the May Ionospheric Charts as applicable to this State. His notes were read out and a condensed version is being included in the W.I.A. notes to the local newspaper.

The Secretary, Mr. Barber (VK5MD), made reference to the Federal Convention, which he attended as a delegate. He stressed the atmosphere of co-operation that prevailed throughout and described the gathering as an outstanding success. He will make a full report at the annual meeting.

In accordance with the Convention's request, a Liaison Officer has been appointed in this Division to collect and forward articles and other material to "Amateur Radio." The writer of these notes has "fallen" for the job.

At the last Council Meeting it was unanimously decided to elect Mr. Joe McAllister as an honorary member.

Mr. McAllister is our energetic Membership Organiser, and has rendered valuable and untiring service to the Institute over a period of years.

Whilst on the topic of membership, it is opportune to mention that the double century has recently been attained and now passed. This achievement is in no small measure due to the efforts of the gentleman referred to in the preceding paragraph.

Another achievement worthy of note is VK5KG's recent effort of a W.A.C. in one day, the feat actually being accomplished over a ten hour period.

The second series of Student Classes commenced on April 29th, with 16 starters, which was nearly double the minimum needed. The course will conclude in time for the October A.O.C.P. Examinations.

The next meeting will be on Tuesday, 11th June, at 17 Waymouth Street, and is the Annual General Meeting for the election of Officers and presentation of reports by the Secretary and Treasurer. Immediately following this, there is to be a special meeting to ratify the proposed Constitution.

WESTERN AUSTRALIA

Hon. Secretary: H. B. Lang,
42 Ord Street, Claremont, W.A.

Meeting Place: Builders' Exchange, St. Georges Ter., Perth.

Meeting Night: Third Monday in each Month.

The third Monday in each month is the General Meeting night of this Division. Monday, May 20th, was the first meeting on the newly appointed night, and the attendance in view of the short notice, was indeed promising.

Business was confined to a general review of the Con-

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ventions proceedings, the official report, and personal observations of our delegate, Major J. Squire's.

Twelve new members were elected and amongst those, a sincere welcome was extended to two old timers in 6SA and 6AG. The Institute will be all the stronger for their support. It was found necessary to change the meeting night to the third Monday in each month, because of the number of Public Holidays that generally occupy the first Monday of each Month. It is to be hoped that all members will keep this date free and come along and swell the crowd.

There is not a great deal of activity locally on 28 mc, however, each week the numbers are increasing and the latest to make the band is 6NL. Victoria was heard to other evening with a very fb. S9T9 signal. 6HL—busy rebuilding and has converter working nicely. It is rumored he has a partner now—hi—. 6WH—busy working on new Beam and comes on every now and then, Fone and CW. 6KW—Ron is bagging some nice dx., both Fone and CW. Latest is G on Fone and more to come. 6RU—Jim also very consistent and doing well. Very busy at moment on Antenna Construction. 6SA—Yes, Jim is there, and in between working what there is to be worked, is planning new rig. 6LW—Not heard much lately, but has been most consistent in the past. Very keen on 50-54 mc band. I guess that new tube will soon be doing duty Wally. 6BX—Just moved from AC (Bluff Pt.) to (DC into town), very girl house cleaning, etc. No Ham activity expected here for some time. 6EL—Just about in "nut house" working out what Xontri tubes will work off 220v. DC mains and provide 50 watts. Working out converter to work into B/C-S/W Rx. Spending a lot of money annoying Valve Companies for details of high

voltage heater tubes. 6WZ—Busy pestering city hams per correspondence for dope on VHF gear and panting for his holidays (nearly over now Harry), and then get cracking on Antenna construction—wood chopping and gardening permitting. 6HM—Tas three element Rotary and FP807 in final 6PJ. Very nice signal; very consistent lately. 6HW, 6IG and 6ZO—Keeping the Port flag flying. All seem to be getting out well. 6FL—Getting nice results from two element Rotary, expects to be on 50mc soon with new Tx and 832 final. 6DF—Has new 3 element Rotary mounted on 3 inch by 3 inch oregon stick—Rotates entire mast. 6GM—Very busy but not on new rig. How soon, when and how, George? 6HT—No word from the Southern port. How about some notes, Harry? 6AJ—Very keen, and getting out well. Has new 2 element Rotary; is only 200 yards from 6FL, often work each other—nice CW! 6TX—Not ready yet. House hunting, like hundreds of others. 6RU—Jim Rumble is our QSL Officer and is open for business. 6BC—Very QRL, Subiaco Radio Club. This club has an ever increasing membership and is to be congratulated on the excellent work they are doing.

And finally, there is a man in Perth, employed by the Perth City Council, whose job is to do some shooting. Yep, he's a crack shot and rarely misses in the city environs, and what he shoots will be left unsaid. But I'd really like to hire that guy to put holes, bang smack through the final tubes of those selfish few, who use that first 100 kc for fone work. If you only have one xtal and it happens to put you in that part of the band. Stay on CW. It will probably improve your fist anyway. If you must go Fone, then save the pennies and give yourself a

birthday present. There are some choice frequencies between 28100 and 29000 kc. Are YOU one of the selfish, inconsiderate few?

73 till next month—6FL.

TASMANIA

Secretary: J. Brown, VK7BJ.

12 Thirza Street, New Town. 'Phone W 1328.

Meeting place, Photographic Society's Rooms,
162 Liverpool Street, Hobart.

Meeting Night: First Wednesday of each month.

General Meeting, first Wednesday in each month at Photographic Society's Rooms, 162 Liverpool Street, Hobart.

The monthly General Meeting was conducted at 8 p.m., on May 1st, attendance was fair, present being L. Jensen, 7LJ, in chair; J. Brown, 7BJ; A. Finch, 7CJ; C. Walsh, 7CW; M. Loveless, 7ML; Doc. Kelly, 7LL; "Pop" Medhurst, 7AH; D. Watson, 7DW; C. Miller, 7CM; T. Connor, 7CT; N. Hopwood, 7GJ; T. Allen, 7AL; M. Conway, 7CL; Koglin; A. Morrisby; G. Oakes.

Apologies C. Oldham, 7XA; P. Allen, 7PA; and Allenby. The first named six constituted the Council, which met earlier, 7.30 p.m. on Council Business as is the usual practice.

At the commencement of General Business, 7CW, was congratulated on having attained his First Class Certificate, further congratulations went to 7BJ, for his F.M. article in "A.R."

The matter of Annual General Meeting was then discussed at length and the old idea of the June long weekend, King's Birthday holiday, was adhered to and the

Saturday night, June 15th, set down in accordance, this will be VK7's 21st Anniversary and we hope to make it a memorable occasion and with existing conditions the committee will be hard put to attain this end as catering can be very difficult to say nothing of finding the amber fluid

The proposal is to hold the Annual Meeting early, commencing about 6 p.m., and follow up with a re-union dinner, all members being asked to make a special effort to attend.

With these arrangements settled the main item of General Business was then called for. Mr. A. Morrisby to give his "Delegates Report" on the Federal Convention at which Alan proved himself to be a budding politician.

The tempo was too fast for anything other than a shorthand expert to take copy, so the best I can say here, is that the Convention was a successful event generally speaking. The Constitutional matters were satisfactory to all.

Some doubt exists about the Regulations Proposals, it being evident that the Federal Executive had no desire to approach the P.M.G.'s Department at this juncture for variations to regulations that they themselves had been party to setting up, and that there had been somewhat of a gentleman's agreement between a majority to defeat any proposals on regulation alterations.

That this should be so, is to say the least of it, most unfortunate for, if it could be shown that anomalies existed, this was the Convention at which to see them rectified as far as possible, particularly as these regulations were drawn up and accepted before the main body of amateurs had completed their reorganising.

The highlight of the evening goes to 7CW, VK7's first "rotary beam" (first at least to my knowledge) having appeared over his domicile.

It has aroused the neighbors curiosity to such a degree

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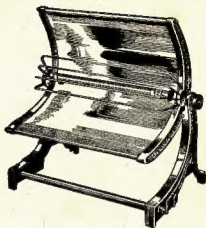
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that a contest seems inevitable, general opinion is that Mr. C.W. has produced an ideal clothes drier for Mrs. C.W. There's one worry—how is poor Mrs. C.W. going to pin the clothes to it?

With a couple of ZS's as a start it should give CW good heart and with much of such DX we can anticipate other neighborhoods being similarly decorated..

I believe 7GJ has to be congratulated, seems a modulated oscillator has arrived, handle is Jack, has he had a go at the key yet GJ?

7AL still trying to produce the "perfect 28 mc RX," The mitter will need rebuilding if that RX doesn't soon perk Tom!

7JH, at Waddamana, reports having given up the idea of 28 mc's in the valley in which he finds himself, says nothing doing at all, is contenting himself by waiting and hoping for the opening of the lower frequencies.

Bad luck Jack and hope you don't have to wait too long.

In referring to our Convention Delegate, A. Morrisby, last month, I stated he was not a licensed ham, although this is so, Alan does hold an A.O.C.P. and even now the station licence may be on the lift.

FREQUENCY MODULATION.

There is a simpler means of producing phase modulation, which is perhaps more suitable for amateur use. Two valves V1 and V2 are fed from a crystal oscillator, a 90 degrees phase shift being made in the drive to V1. The output of both tubes is fed into a single tank circuit. Modulation is applied by means of a push-pull transformer to the grid, thus the grids are 180 degrees out of phase for audio frequency. At no modulation the two carriers combine to form a new carrier with an intermediate phase. Under modulation, when the output of one valve is reduced, the output of the other is increased and

vice-versa. Examination of vector diagrams will show that considerable phase modulation occurs; some A.M. also occurs, but this may be eliminated by a limiter in the transmitter or else by relying on that one in the receiver. With this circuit it is possible to get a direct deviation ratio of 1.5 with sufficient linearity for voice working and so not so much frequency multiplication is required. If the oscillator is in the 160 metre band and 200 cycles is the lowest audio frequency we are interested in, a deviation of 300 cycles can be obtained directly. By multiplying to 10 metres a deviation of approximately 5 Kc/s can be obtained.

The treatment in this article can only be taken as an outline, as space forbids description of the complete units, but, for amateur use, the reactance tube system, particularly for the higher frequencies where the simple self excited oscillator can be used, appears to be most suitable. For practical transmitting and receiving circuits past issues of Radio and QST should be referred to, as several outfits of all types have been described in these.

Not much space is left for discussion of aeriels, but for amateur use any aerial suitable for the UHF band required will be sufficient. For broadcasting purposes, American engineers seem to have settled on horizontal polarisation which, they claim, has the advantage of better signal/noise pickup ratio. A low angle field uniformly radiated in a horizontal direction is desired, and whilst this is easily done with vertical polarisation by using a vertical aerial with each half wave in phase, it is not so simple for horizontal polarisation. The usual horizontal aerial, at these frequencies, is markedly directional. Two horizontal types have been evolved. The one that is coming into use now is the doughnut which is simply a circular loop laid flat. The directional properties of a vertical loop are well known, but when it is mounted horizontally it gives uniform radiation in all horizontal directions. A

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number of loops may be mounted above each other to
concentrate the radiation at low angle.

The older form is the turnstile, two half wave doublets
being mounted 90 degrees apart and excited 90 degrees
out of phase. This causes the field of one of them to fill
in the hollows of the other and so a uniform horizontal
field is produced. This type may also be of interest to
amateurs for use on the lower frequency band. A number
of these may also be stacked one above the other to in-
crease the low angle radiation.

For reception, if only one or two directions are required,
a simple half wave aerial will do, but if omnidirectional
reception is required, a doughnut or turnstile will be
needed. Of course a rotary beam would be the ideal pick-
up source. In fact the best arrangement, for lazy people,
would be a beam which would be controlled by the received
signal strength and would rotate until the maximum signal
was being received.

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Ma 3-inch meter, £2; Weston 3-inch multiscala meter for
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CORRESPONDENCE

Correspondents are requested to keep their letters short
and to the point. The Editor reserves the right to delete
anything he may think fit. The views expressed by
correspondents are not necessarily those of the pro-
prietors.

Editor "AR."

Labuan Island.

For your information the call sign of this station is
now VS3JH and not VS6JH as previously. The QTH
remains the same, Sgt. Hunt, J. A., c/o HQ. B.M.A.,
Labuan Island, North Borneo.

Amateurs in this area are now licenced for ten with 50
watts input, and as far as I can see I am the only Ham
to take advantage of this.

I would appreciate it if you would make it known to
VK's through the Magazine, that some delay with QSL
cards from here is likely. I have an enormous amount
of cards to hand and now I cannot cope with them. I
have managed so far to keep more or less clear but it
seems very unlikely that I can keep it up for long.

The first copy of your magazine (March issue) arrived
to-day although I have been a member since last October.
Doubtless due to the poor mail facilities these days.

Yours etc.,

JOHN A. HUNT, VS3JH.



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